ENERGY INFORMATION PAPER

RESIDENTIAL ENERGY TRENDS

ENERGY TRENDS IN ONTARIO
A FIVE PART SERIES

87-00009/

INTRODUCTION

This paper is one of a five-part series that analyzes the recent historical trends in Ontario's energy consumption, and complements the forecast for provincial energy consumption contained in **Energy 2000 – The Shape of Ontario's Energy Demand.**

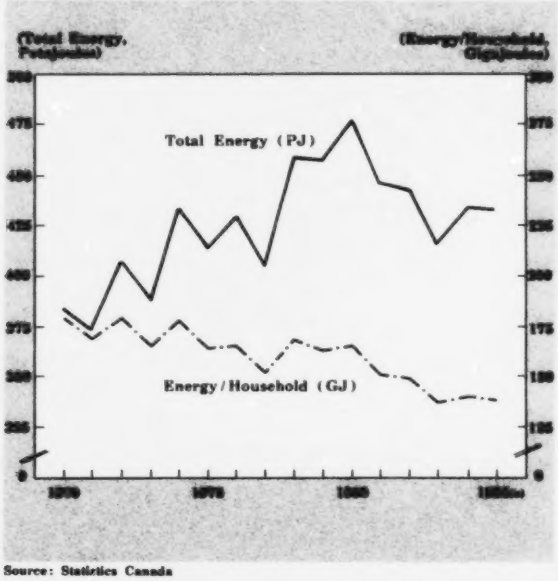
This paper details the trends that have emerged in residential energy use in Ontario. The other papers in the series highlight trends in industrial, transportation, commercial and institutional buildings, and total energy use for the province.

RESIDENTIAL ENERGY TRENDS

Energy is used in homes for three main purposes: heating, lighting and operating appliances. A variety of fuels, such as oil, natural gas, electricity, wood and propane, can be used for heating. Lights and appliances are virtually all powered by electricity.

In Ontario, the largest portion of residential energy is used to heat our homes. In 1985, about two-thirds of total energy use was for space heating. The remaining one-third was more or less equally divided between water heating and appliance uses, including lighting. Natural gas supplied about one-half of the total energy used in 1985; oil 15 per cent; electricity 30 per cent; and other fuels 4 per cent.

HOUSEHOLD ENERGY USE

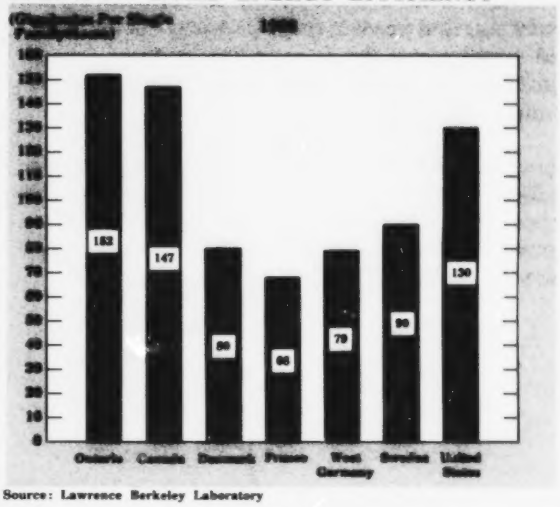


Source: Statistics Canada

Although the total energy consumption increased by nearly 14 per cent over the 1970-85 period, energy use per housing unit declined by 23 per cent.

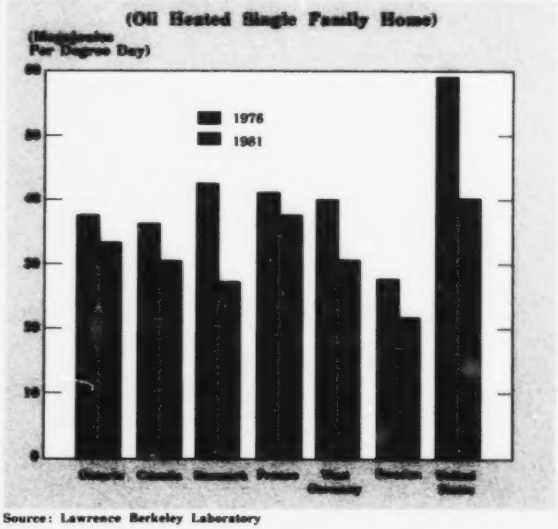
At first glance, Canadian and Ontario homes seem to use much more energy than their European counterparts and United States neighbours. However, international comparisons can be deceiving. If European or U.S. homes were subject to Canadian weather conditions, the comparison would be much more favourable. Taking our climate into consideration, Canadian homes are at least as efficient as those in Europe, and more efficient than those in the United States.

O. E. C. D. HOME ENERGY EFFICIENCY



Source: Lawrence Berkeley Laboratory

SPACE HEATING IN THE O. E. C. D.



Source: Lawrence Berkeley Laboratory

Several factors are responsible for the improvement in energy efficiency in Ontario since 1970. One important influence is the change in the types of housing that most of us live in. Another factor is the actions taken by individual homeowners to improve their home heating systems and reduce the amount of warm air leaking to the outside. In addition, higher fuel prices and an increasing awareness of the money that can be saved from reducing all types of energy consumption caused Ontarians to turn down their thermostats and shut off their lights.

Housing Growth and the Shift to Smaller, More Energy-Efficient Homes

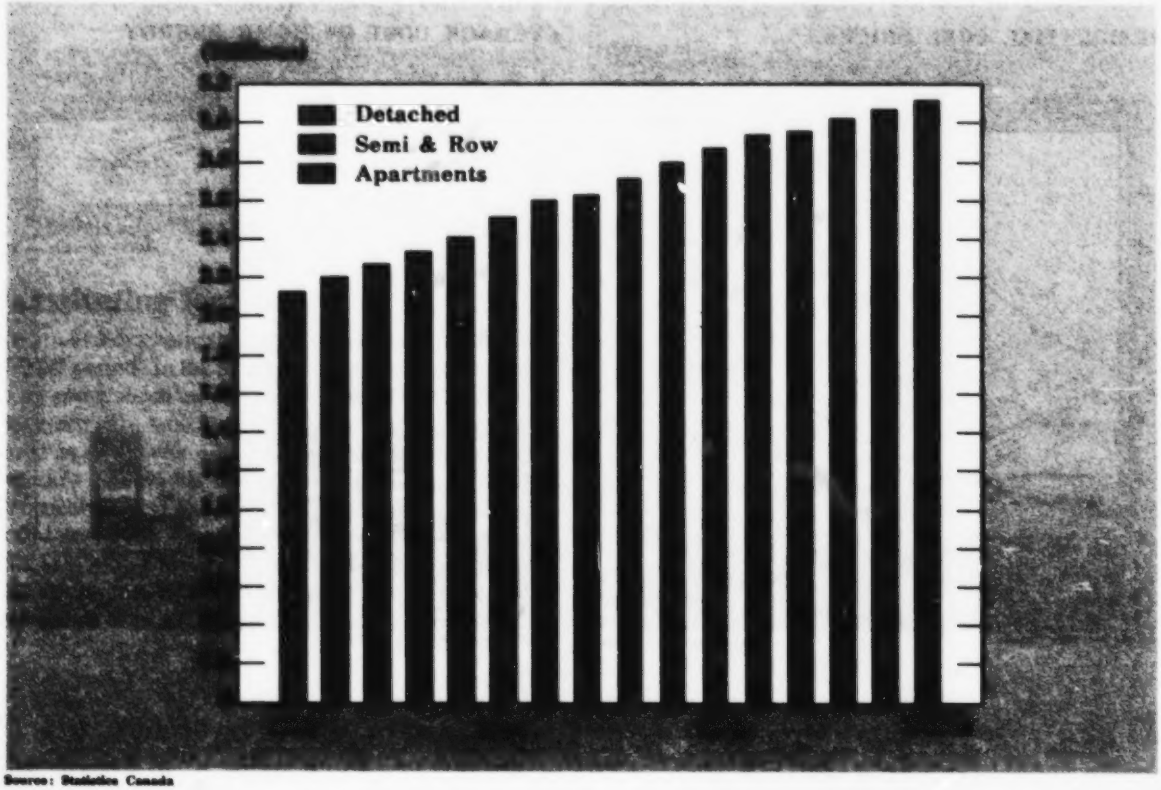
The number and types of homes in Ontario play a major role in determining the level of residential energy consumption. The total number of homes in Ontario has grown an average of 2.6 per cent annually since 1970. In recent years, however, the rate of housing completions has decreased, due to the 1982 recession and high financing charges. By the end of 1985, there were about 3.1 million homes of all types in Ontario, compared to 2.1 million in 1970.

Since 1970, the types of new homes built in the province have changed gradually. More apartments, semi-detached and row houses have been built than single-detached homes. In 1970, there were 530,000 apartments, and 180,000 semi-detached and row house units. By 1985, there were 918,000 and 378,000 respectively – an increase of 586,000 multiple-unit houses. By contrast, single, detached homes increased by 400,000 over the same period.

Without any changes in the efficiency of energy use, the availability of more houses means more energy consumption. But the composition of the housing stock is important, because different types of houses use energy in different ways, and with different levels of efficiency. An apartment or row house uses less energy than a single, detached dwelling of the same vintage, because there are fewer openings to the outside, because the shared walls reduce space heating requirements, and because the homes are generally smaller.

Residential energy demand peaked in 1980. Even though the total number of homes increased in the 1980-85 period, there was a marked decline in energy consumption. Clearly, Ontario's households have become more efficient in their energy use.

ONTARIO'S HOUSING STOCK



Source: Statistics Canada

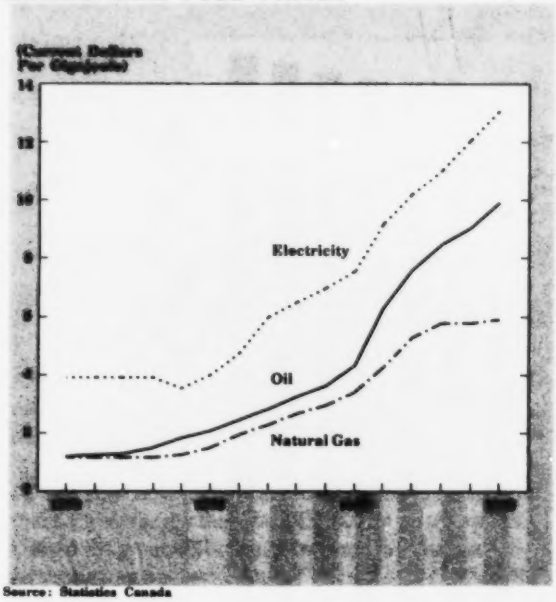
Increased Energy Efficiency – The Effect of Prices

The prices of all conventional fuels rose sharply from 1970 to 1985, but the period of greatest price escalation was from 1973 onwards. In 1973, the average Ontario household spent about $300 per year for energy, excluding transportation. By 1985, this cost had risen to nearly $1,200. After accounting for inflation, this represents a real cost increase of about 43 per cent.

In the calculation of the Consumer Price Index, fuel expenditures by households make up 10 per cent of the cost of shelter index, and close to 30 per cent of transportation costs. Altogether, direct expenditures on energy amount to about 8.4 per cent of the typical household's budget.

But, these costs are just the direct purchases of energy forms such as natural gas, heating oil, electricity and transportation fuel used by households. There are also indirect purchases of energy embodied in virtually all the other goods and services that consumers buy.

RESIDENTIAL FUEL PRICES



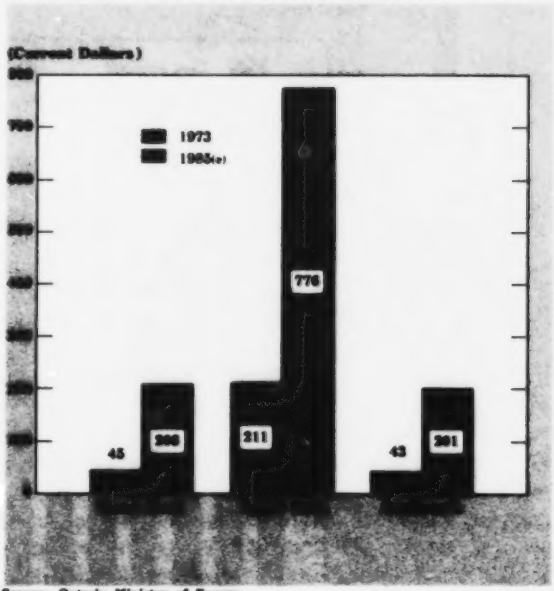
Source: Statistics Canada

For example, a basket of groceries contains many items that are packaged, either in cans, boxes or plastic. To produce each of these packaging materials requires energy in one form or another. Taking the analysis one step further, it also takes energy to produce the food in the packages — energy in the form of fertilizers, fuel for tractors, or the energy used to operate a processing plant.

If the energy component of the entire range of goods and services purchased by householders was combined with direct energy purchases, the fraction of total annual income used to buy energy would be much larger than 10 per cent. Moreover, when energy prices increase, they affect housing and transportation costs in a major way, and all other prices in varying degrees. Energy price changes thus have important inflationary consequences.

Increases in fuel prices sparked an unprecedented energy conservation effort by Ontario's homeowners. Insulating, caulking and weatherstripping were encouraged by government programs such as the Canadian Home Insulation Program (CHIP) and HeatSave.

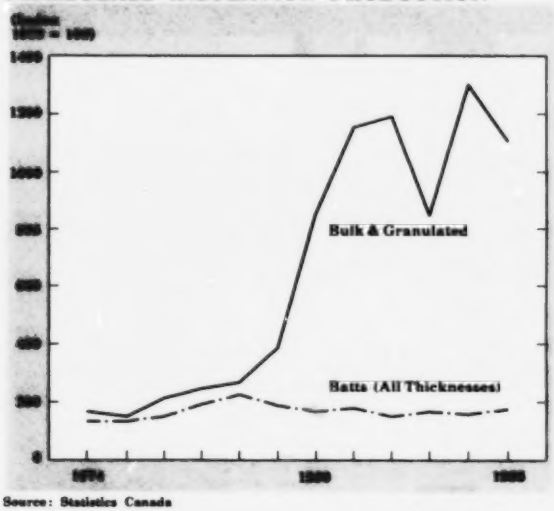
AVERAGE COST OF HOME ENERGY



Source: Ontario Ministry of Energy

Both new and existing homes across Ontario were subjected to these energy-saving activities. One indicator of how much insulating and sealing was taking place is the Canadian production of insulation materials in the 1974-85 period. Bulk and granulated insulation that is used in retrofitting existing homes had a very large increase in production. Production of batt insulation, which is used in new homes, did not increase. Instead it changed to thicker sizes that have more insulation value. In the last 10 years, the insulating quality of new-home construction has doubled.

CANADIAN FIBREGLASS INSULATION PRODUCTION



Source: Statistics Canada

Substituting for Oil

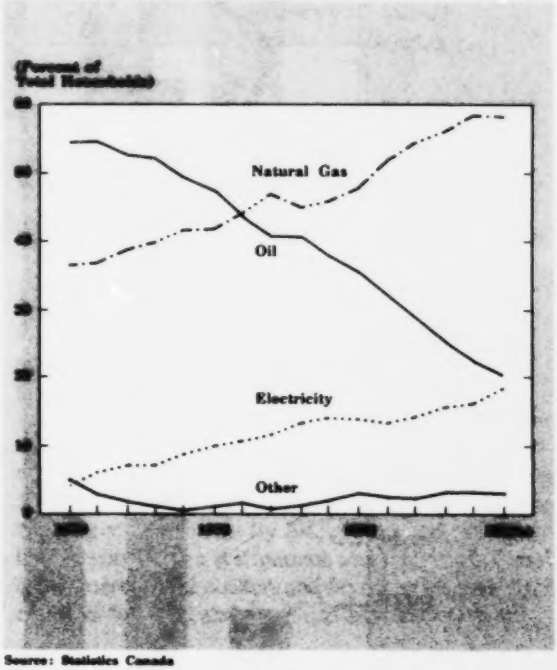
There was a dramatic shift from oil to other fuels in the 1970-85 period. In the space-heating market there was a very pronounced movement to replace oil with natural gas, electricity, wood or other fuels, such as propane. Space heating with oil declined from 55 per cent of Ontario's households in 1970 to 20 per cent in 1985. Electrical heating had the greatest growth, increasing from 4 per cent of households in 1970 to more than 18 per cent in 1985. During the same period, natural gas heating increased from just over one-third of all households to nearly 60 per cent.

Southwestern Ontario has the greatest concentration of homes using natural gas as a heating fuel, at nearly 60 per cent. This compares with just over one-quarter in Eastern Ontario. Electrical space heating is most popular in the eastern and northeastern regions of Ontario, where electricity has about 25 to 30 per cent of the market. Wood heating is most popular in northeastern and northwestern Ontario, where it is used in 12 to 13 per cent of the homes.

Table 1: Space Heating Fuels by Region: 1984

	Oil	Gas	Electricity	Wood	Other Fuels
Eastern	38	27	28	6	1
Central	21	58	18	3	–
Southwestern	16	58	20	4	1
Northeastern	24	34	29	12	2
Northwestern	19	48	19	13	1

HEATING FUEL SHARES

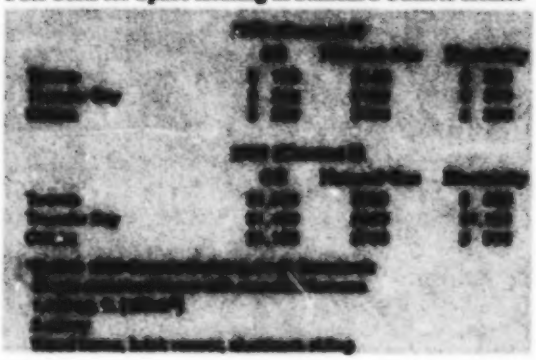


Source: Statistics Canada

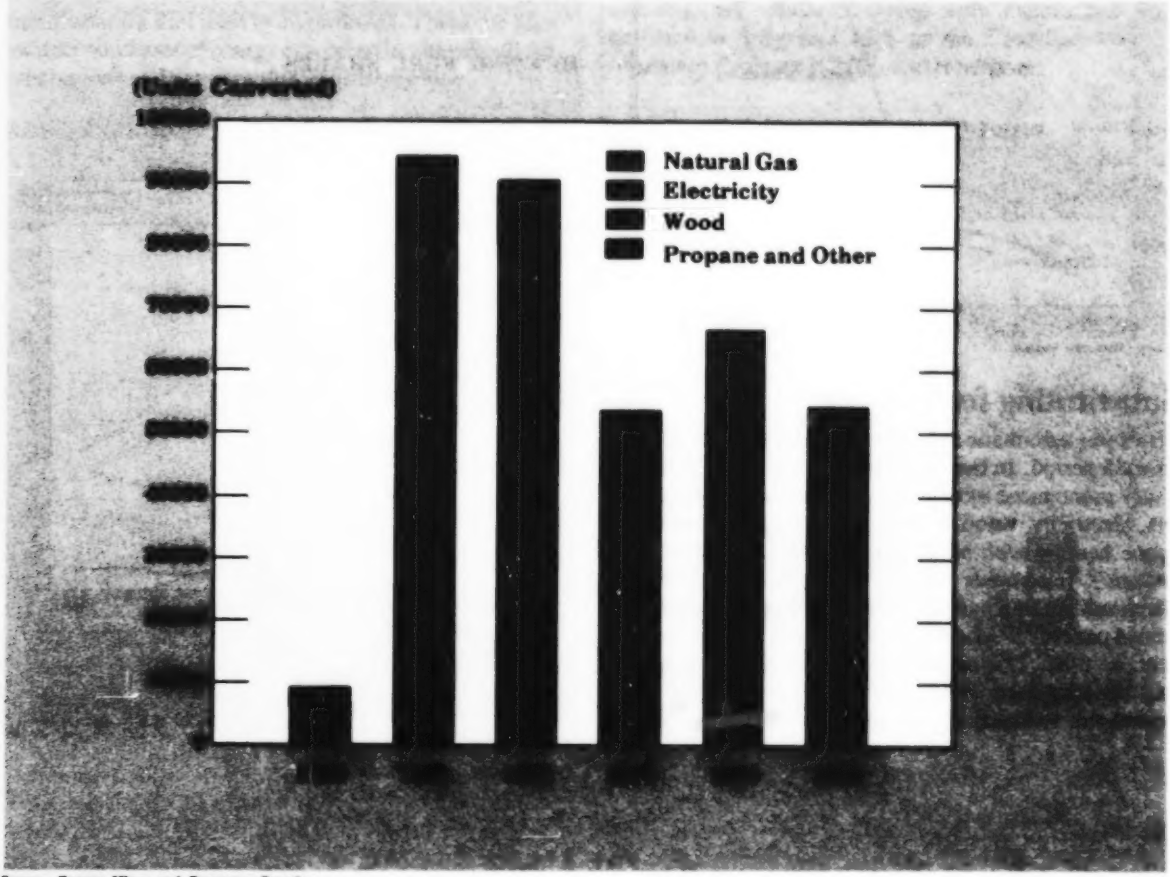
There are two major reasons why oil's share of space heating changed so drastically. First, the increase in oil heating fuel prices made it 50 per cent more expensive than natural gas by 1985. The second reason was the availability of government grants to assist homeowners in converting their heating systems.

Since 1981, the Canada Oil Substitution Program (COSP) has provided homeowners with up to $800 to switch from oil heating. During the program, which was active from October 28, 1981 through March 1985, more than 300,000 heating systems in Ontario were converted from oil to some other fuel — most often to natural gas. At the same time, homeowners were able to upgrade the efficiency of their heating systems.

Table 2:
Fuel Costs for Space Heating in Standard Ontario Homes[1]

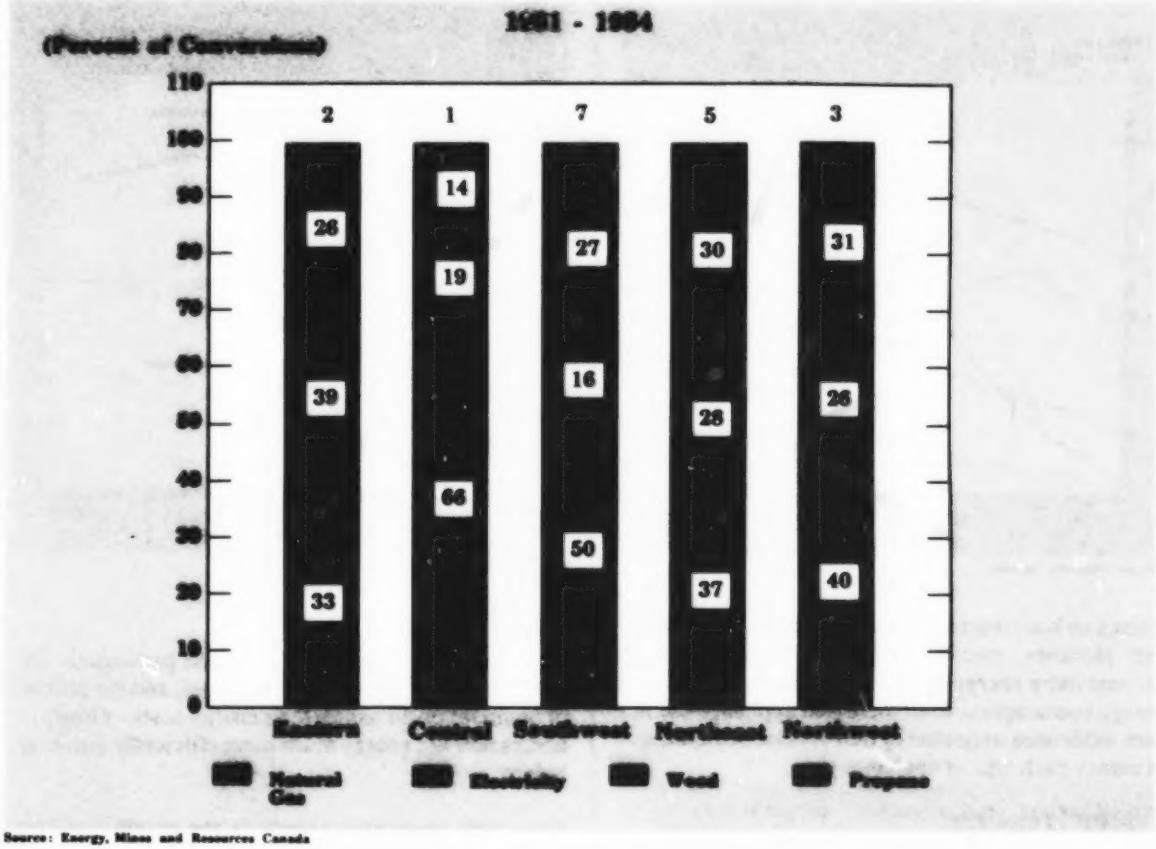


ONTARIO C.O.S.P. CONVERSIONS



Source: Energy, Mines and Resources Canada

REGIONAL C.O.S.P. CONVERSIONS



Source: Energy, Mines and Resources Canada

High-efficiency condensing gas furnaces and electric heat pumps are just two of the options available to homeowners concerned about the cost of heating their houses. About 25 per cent of the gas furnaces currently being installed in Ontario are high-efficiency units. Most of these installations are retrofits — replacing old oil or gas furnaces — rather than installations in new homes.

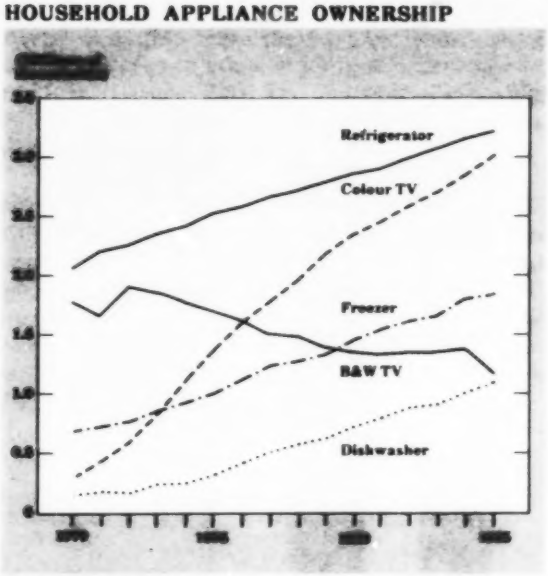
A breakdown of COSP conversions by region in Ontario shows that in the more rural areas of the province, wood challenged natural gas as the preferred fuel when homeowners were converting. In fact, the use of wood for home heating has grown by about 13 per cent per year since the early 1970s. By the end of 1985, about 140,000 Ontario homes used wood as their primary source of heat. Thousands more burn wood in stoves and fireplaces to supplement a primary space heating system that uses conventional fuels.

Increased Appliance Use

Operating appliances and lighting systems requires significant amounts of energy, and represented about 16 per cent of all home energy consumption in 1985. The use of every type of appliance, except the black-and-white television, has grown steadily since 1970. Colour televisions had the strongest growth, at 18 per cent annually, while refrigerators grew at the same rate as the building of new homes. By 1985, 99 per cent of Ontario's homes contained a refrigerator and television. Nearly three-quarters had washers and dryers, more than 50 per cent had freezers, and one-third used dishwashers.

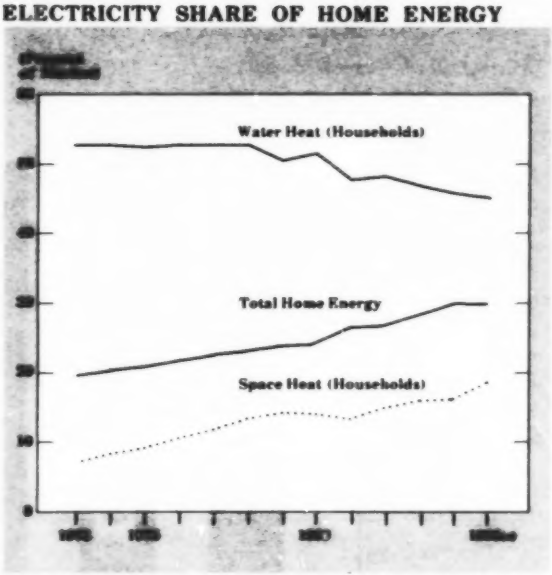
Appliances are almost always powered by electricity. Although electricity has made significant progress in displacing oil in the space-heating market, the growth in appliance use made a significant contribution to

HOUSEHOLD APPLIANCE OWNERSHIP



Source: Statistics Canada

ELECTRICITY SHARE OF HOME ENERGY



Source: Statistics Canada

electricity's increased share of total household energy use. However, over the years, appliances have also become more energy-efficient. So, the impact on total energy consumption from increased appliance use has been moderated somewhat by the decrease in the amount of energy each type of appliance uses.

Water Heating

Ontario uses about the same amount of energy to heat water as to operate all the appliances in the province. In the mid-70s, oil provided about 5 per cent of the water-heating needs of the residential sector. By the early 1980s, heating water with oil had declined to about 2 per cent of the total, with natural gas and electricity sharing the remaining 98 per cent. In recent years, natural gas water heaters have overtaken electricity and now provide just over half of the hot water in Ontario homes.

Summary

As a result of all these changes – and particularly the trend to smaller, more efficient houses, and the actions of homeowners to reduce their energy costs – Ontario's homes now use energy much more efficiently than ever before.

Even with substantial growth in the number of new homes since 1980, the total amount of energy used by homes has not increased since then. The evidence suggests that a new trend has been established – one in which improvements in the energy efficiency of new and existing homes will largely offset the energy demands of an increasing number of homes in the years to come.

Copies of the five publications in the Energy Trends in Ontario series:

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